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ECOTECT and EnergyPlus

by

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ECOTECT is a software package with a unique approach to conceptual building design. It couples an intuitive 3-D design interface with a comprehensive set of performance analysis functions and interactive information displays. The latest version of ECOTECT contains quite a few new refinements for the export of building models to EnergyPlus (and Radiance, too). This means that you can work within an advanced modelling and visualisation interface, making use of a vast array of conceptual design tools, while still using EnergyPlus, the very best analysis and validation software.

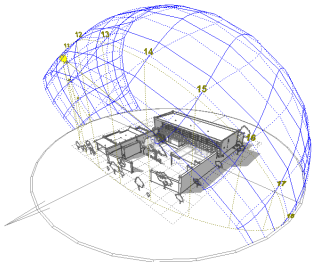
Fundamentally, there are five main reasons to consider ECOTECT as part of your analysis workflow:

Modelling and Visualisation
As a conceptual design tool, ECOTECT provides its own fast and intuitive modelling interface for generating even the most complex building geometry. Most importantly however, the model is editable. Tasks such as resizing or inclining walls, manipulating complex curves, rearranging zones, moving apertures or even adding and deleting surfaces are all straightforward.

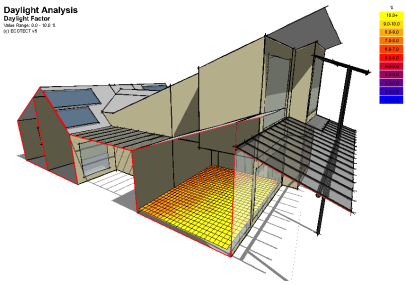
To assist in the design process, you can also visualize the model in OpenGL, overlaying Sun-path diagrams, shadow information, lighting grids or simply move the model around in real time. With its unique 'sketchiness' parameters, you can present analysis results directly within the context of the building model, safe in the knowledge that the client will understand that they are looking at preliminary ideas and not the finished product.

One central repository for all building data
Each material in ECOTECT can store a wide range of information including basic thermal and surface properties, detailed layer descriptions, acoustic response and even cost and environmental impact data if it is available to you. Similarly, you can generate and assign complex annual operational schedules and hourly profiles for controlling occupancy, appliances or internal conditions.

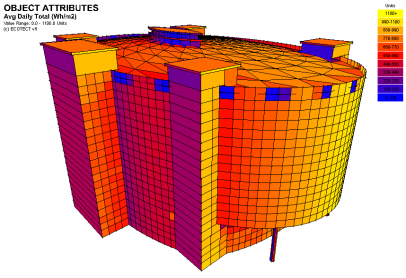
Internal analysis functions
ECOTECT offers a wide range of internal analysis functions which can be used at any time while modelling. These provide almost instantaneous feedback on parameters such as sun penetration, potential solar gains, thermal performance, internal light levels, reverberation times and even fabric costs as you develop and refine the design. More importantly, you can also use generative functions as you design, allowing you to automatically shape shading devices given specific performance parameters or even interactively spraying acoustic rays to accurately position reflectors.



Overlaying a Sun-path on the model view.



Internal daylight factors shown over a standard working plane.



Annual cumulative solar radiation over the external surfaces.

These analysis functions enable ECOTECT to automatically calculate volumes and internal surface areas for each zone, as well as all aspects of shading and inter-zonal connectivity before you export the model.

Import and export capabilities

Once you have built the model, ECOTECT can export directly to a range of other analysis tools including EnergyPlus and Radiance. You can also export to DXF, VRML and even POV-Ray for more conventional rendering. This means that you can embed all the building data and design information into a single model file which can then be used as the basis for a whole suite of more focussed lighting and thermal analysis. Much of the data produced in these analyses can then be read back in and visualised within the context of the original ECOTECT model.

Combine these features with a powerful scripting engine for creating and editing building geometry, invoking analysis functions and analysing results, and you have the perfect tool for iteratively generating and optimising solutions for a range of design problems.

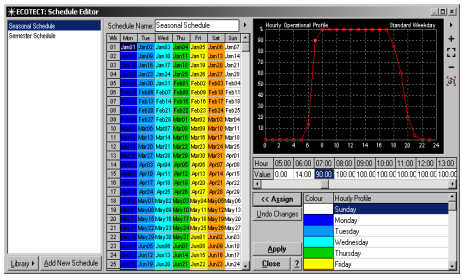
Working with EnergyPlus

While different analysis tools have different input requirements, there are many aspects of a building model that are common to all tools. Thus, if you are familiar with the generation of models for performance analysis in other programs, you will find it very quick to pick up the modelling process in ECOTECT.

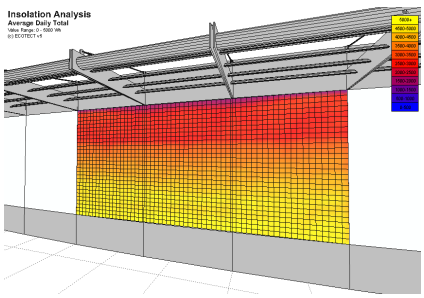
Obviously there will be some differences between what ECOTECT will let you model and what EnergyPlus will accept, such as the 4-node limitation on surfaces; however, these are all checked and explained whenever you export.

Future Development

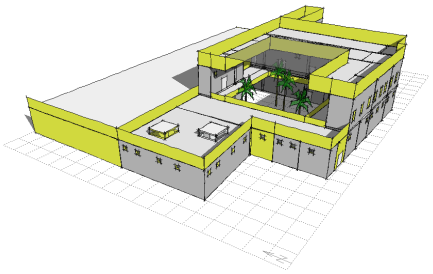
Research work is ongoing on all aspects of the ECOTECT interface. Thus, if you have any suggestions or comments on how we can improve EnergyPlus support within the software, please let us know.



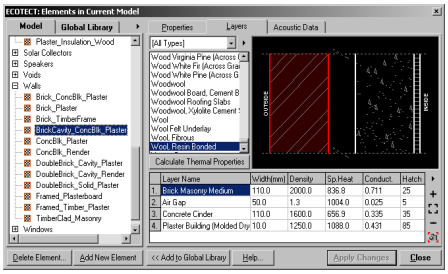
Working in EnergyPlus-mode when defining operational schedules.



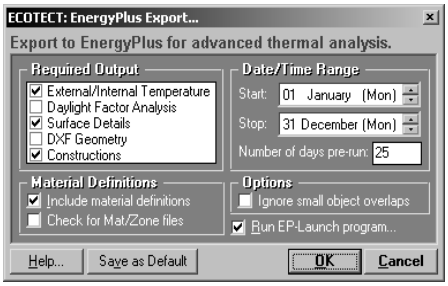
Analysing the effectiveness of a complex louvered shading device.



An example adobe house model generated for use in EnergyPlus.



An example material definition showing sectional layer information.



The export interface to EnergyPlus allows you to control output data.

You can download an evaluation version of ECOTECT at http://www.squ1.com/ which is fully functional except for saving and printing.